

REMARKS

Reconsideration and allowance of the subject patent application are respectfully requested.

Claim 13 has been amended to obviate the objection thereto. Amendments of a formal nature have been made to claims 7, 11 and 20-23.

Claims 1, 3, 6, 7, 10-13 and 19-23 were rejected under 35 U.S.C. Section 103(a) as allegedly being "obvious" over Lock (WO-99/67974) in view of Hooley (WO-01/47041).

The office action contends that Lock discloses a loudspeaker including all the recitations of claim 1 except that Lock employs an electromagnetic actuator (driver unit 16) including a magnet 17 and voice coil 18, whereas claim 1 requires at least one piezoelectric actuator. Hooley is alleged to describe a piezoelectric actuator and the rejection is based on a contention that it would have been obvious to combine the apparatus of Lock with the apparatus of Hooley. Essentially the office action asserts that it would have been obvious to replace the electromagnetic actuator of Lock by the piezoelectric actuator of Hooley.

A key point is that the loudspeaker of Lock is not balanced. In particular, Lock discloses that the two diaphragms are driven by a single electromagnetic actuator comprising a magnet and a voice coil. As a result, the output from the two loudspeakers is not balanced in that the displacement of the two diaphragms differs. This is because a magnet is significantly heavier than a voice coil. Therefore, although the force applied to each diaphragm is the same, the displacement of the diaphragm attached to the magnet will be less than the displacement of the diaphragm attached to the voice coil as a result of the higher mass of the magnet.

By way of example and without limitation, an advantage achieved by using a piezoelectric actuator arranged in the manner specified in claim 1 is that the loudspeaker can be balanced. Specifically, as a result of the claim 1 requirement that the piezoelectric actuator is coupled by its two ends to the two diaphragms, the displacement of each diaphragm can be the same and so the loudspeaker is balanced. This arrangement and the resulting advantage would not have been obvious from any prior art document.

In particular, this arrangement and advantage is in no way shown or suggested by Lock and moreover would not have been made obvious by Hooley. Hooley teaches that the

piezoelectric actuator disclosed therein can be used in a loudspeaker in general terms, but this would not have made it obvious to apply the piezoelectric actuator in the specific loudspeaker of Lock comprising two diaphragms with the specific configuration required by claim 1 (i.e., with the two ends attached to the two diaphragms) in order to achieve the advantage of a balanced loudspeaker.

Further evidence of the non-obviousness of the claim 1 is present in Borker (WO-00/02415) and Davis (U.S. Patent No. 6,345,102) (which are of record in the now-granted counterpart British Patent No. 2,409,125). In the loudspeakers in these documents, each diaphragm is driven by a separate piezoelectric actuator, the actuators not being coupled together. This implies that even when employing a piezoelectric actuator in a loudspeaker comprising two parallel diaphragms, it would not have been obvious to employ the piezoelectric actuator in the configuration required by claim 1, in which the two ends of the actuator are coupled to the two diaphragms.


The dependent claims are allowable by virtue of their dependency on allowable claim 1.

The pending claims are believed to be allowable and favorable office action is respectfully requested.

Respectfully submitted,

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